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THE GEORGE WILLIAMS HOOPER FOUNDATION  
UNIVERSITY OF CALIFORNIA MEDICAL CENTER  
AN FRANCISCO 22, CALIFORNIA

June 19, 1952

Dr. J. Lederberg  
Department of Genetics  
University of Wisconsin  
Madison 6, Wisconsin

Dear Josh:

After reading your letter I am more puzzled than ever.

The word prototroph either refers to the phenotypic nutritional requirements of the wild type (whether that wild type be an autotroph or a heterotroph --these two words are used in the sense described by Lwoff, van Niel, et al., Cold Spring Harbor Symposia, 1946) or it does not. Since you say prototroph does have this meaning, then to use it to refer to the phenotypic requirements of a strain of *P. pestis* which requires several amino acids should cause no confusion. If words are to be the tools of men, it would seem to me we have to be extremely careful in our individual usage of them.

I do not know how you arrived at the derivation of the word auxotroph. The only discussion of the meaning of the word that I have come across appeared in the MGB, where B. Davis introduced the word, and also as a footnote in an article by Davis and Mingioli, *J. Bact.*, 60, 17-28, 1950. "The terms 'auxotrophic' (Lat. auxilium = aid; Gr. troph = food) and the corresponding noun 'auxotroph' are suggested for convenience in denoting biochemical mutants with increased nutritional requirements." This, from all the people I spoke to at the SAB meetings, is the accepted definition of the word. My suggestion of a Greek stem, auxanein, in place of auxilium, doesn't change the meaning of the word to any extent, but was put forth merely to straighten out the mixed language difficulty.

I do object to your use of the words auxo-heterotrophic and auxo-autotrophic. Davis was trying to avoid the general confusion involved in the use of autotroph and heterotroph by adopting the term auxotroph. If you feel autotroph and heterotroph are worth using, why not accept the Lwoff and van Niel redefinitions, instead of adding an additional prefix to them? I for one would not like to perpetuate the meaning of these words in the form that you are doing.

Besides, the acceptance of your usage of auxo-autotroph and auxo-heterotroph, or just using autotroph and heterotroph redefined, would not solve the problem I am presented with. A mutant that differs from the wild type or ~~prototroph~~ by requiring four amino acids instead of five could not be called an auxo-autotroph. It is far from being autotrophic. In place of these absolute terms, what we are in need

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of are terms signifying mutational direction from the wild type. The term auxotroph, meaning a mutant with increased nutritional requirements, would fit this bill. Mutation in the opposite direction, toward autotrophy, could be met with the word ischnotroph, meaning decreased food requirements, although I am not too sold on it. The stem "ischno" is not a common one and is hard on the English ear. Davis has suggested "meiotroph", coming from the stem "meio" meaning less -- this could be condensed to "miotroph", and sounds a bit better than ischnotroph.

As for your suggestion to use an entirely new suffix, I believe that would be adding to the general confusion. I would prefer to see some agreement arrived at in the definition and usage of existing terminology and to work within that framework.

I would not like to draw any conclusions regarding the ancestral prototype of *P. pestis*. For all we know, it may not be related at all to an autotroph but to a primordial heterotroph.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Ellis'.

Ellis Englesberg